

REMARKS

Claims 1, 4 – 8, 10 – 12, and 16 – 21 are pending. Claims 2 – 3, 9, and 13 – 15 have been cancelled and claims 1, 7, and 16 – 20 have been amended. No new matter has been added.

I. AMENDMENT TO THE CLAIMS:

Claim 1 and 7 have been amended to recite the limitations claims 13 – 15. In particular, claims 1 and 7 now include the step of subjecting the extracted hydrogen fluoride (HF) to flash distillation follow by column fractionation distillation to produce anhydrous hydrogen fluoride having less than 200 ppm of sulfur impurities. Support for these claim amendments can be found in original claims 13 – 15 and also in the original specification at page 11, lines 3 – 6.

Claims 16 – 20 have been amended to correct dependency.

II. PRIOR ART REJECTIONS:

The Office has rejected claims 1, 4, 7 – 8, 10 – 11, 15 – 20, and 22 under 35 U.S.C. § 102(b) as being anticipated by GB 1,052,118. Specifically, the Office asserts that GB ‘118 teaches a process for separating HF from fluorine-containing halogenated hydrocarbon mixture wherein the mixture is contacted with aqueous sulfuric acid having a concentration of at least 70% to selectively absorb the HF.

The Office also rejects claims 1, 4 – 8, and 10 – 22 under 35 U.S.C. § 103(a) as being obvious over GB ‘118, stating that, with respect to sulfuric acid at concentrations other than “at least 70%”, the overlapping nature of such ranges would render the

claimed invention *prima facie* obvious. In addition, the Office asserts that GB ‘118 teaches that the HF which is absorbed by the sulfuric acid can be separated and recycled, and thus, without a showing or criticality or unexpected results, it would have been obvious to one skilled in the art to use any known method in the art, such as flash distillation or fractional distillation, to separate the HF from the sulfuric acid.

The Office has also rejected claims 1, 4 – 8, and 10 – 22 under 35 U.S.C. § 103(a) as being obvious over US 5,874,658 (Belter) in view of US 5,895,639 (Swain) and GB ‘118, and optionally in view of 5,763,706 (Tung). Specifically, the Office asserts that Belter teaches a method of separating a HF from a hydrofluorocarbon mixture by treating the mixture with sulfuric acid and that Swain discloses that HF separated from the sulfuric acid via distillation. The Examiner takes Official Notice that flash distillation and the step of distilling a diluted HF to obtain anhydrous HF are known and conventional steps in the art.

A. CLAIMED INVENTION:

Applicants have discovered that anhydrous HF having very low levels of sulfur and tar impurites (the latter expressed in terms of Total Organic Carbon or “TOC”) can be separated from azeotropic and nonazeotropic HF/halocarbons mixtures by extracting the HF from the mixture using dilute sulfuric acid, subjecting the extracted HF to flash distillation, and then subjecting the flashed HF to column fractionation. This process surprisingly produces anhydrous HF having a sulfur impurity level of less than about 200 ppm.

B. PRIOR ART REFERENCES**1. GB 1,052,118**

GB '118 discloses a process for separating HF from a gaseous mixture produced by fluorinating a halocarbon with HF, wherein the mixture is contacted with aqueous sulfuric acid of at least 70 wt. % concentration to absorb the HF. GB '118 further teaches that the absorbed HF can be recovered via a stripping operation.

2. US 5,874,658 (Belter)

Belter discloses that an alkanolamine solution can be used as a phase separation additive to separate HF from saturated fluorinated aliphatic hydrocarbons. The HF can be recovered from the HF/alkanolamine mixture by distillation. Belter also discloses that 100% sulfuric acid or < 100% sulfuric acid can be used in lieu of the alkanolamine solution.

3. US 5,895,639 (Swain)

Swain, which is assigned to the same assignees as the present application, discloses a process for separating HF from an azeotropic mixture of HF and fluorocarbons using concentrated sulfuric acid as an extraction agent. According to Swain, the HF can be separated from the sulfuric acid via distillation.

4. 5,763,706 (Tung)

Tung, which is also assigned to the same assignees as the present application, teaches an integrated process for producing HFC-245fa. Included in this process is the step of recovering HF by contacting a mixture containing HF with sulfuric acid to form a sulfuric acid/HF mixture. Tung teaches that the HF can then be recovered from the sulfuric acid/HF mixture.

C. ARGUMENTS**1. GB ‘118 does not teach each and every element of the invention as presently claimed.**

With respect to claims , 4, 7 – 8, 10 – 11, 15 – 20, and 22, GB ‘118 does not teach, or even suggest, a process for producing anhydrous HF having a flash distillation step followed by a column fractionation step. In order for a reference to be anticipatory, it must teach each and every element of the claimed invention. MPEP 2131. Claims 1 and 7 have been amended to recite a flashing process followed by a column fractionation process. Since GB ‘118 does not discloses either of these two process, let alone both processes, it cannot be considered to anticipate the claimed invention. Applicants, therefore, respectfully request that the Office’s rejection on this ground be withdrawn.

2. The cited references, alone or in combination, fail to disclose a process involving flash distillation followed by column fractionation.

The combination of GB ‘118, Belter, Swain, and Tung fails to disclose a process involving flash distillation followed by column fractionation. It is incontrovertible that,

to establish a *prima facie* showing of obviousness, the cited reference, or combination of references, must include each and every limitation of the claimed invention. MPEP 2143. Here, the claimed invention, as amended, specifically recites that the method for recovering anhydrous HF includes the step of subjecting extracted HF to flash distillation followed by column fractional distillation.

The Examiner does not allege that the cited references teach these elements of the claim, but instead takes Official Notice that flash distillation and the step of distilling a diluted HF to obtain anhydrous HF are known and conventional steps in the art. Applicants do not dispute the assertion that flash distillation and column fractionation are known processes in the art. However, Applicants have discovered that anhydrous hydrogen fluoride having very low sulfur content can be achieved by subjecting an extracted HF/dilute sulfuric acid mixture to combination of flashing and column fractionation, particularly flashing followed by column fractionation. Such a combination of techniques is neither known nor obvious in view of prior art. It is inappropriate, therefore, for the Office to rely on merely its assertion that flash distillation and column fractionation are known processes in the art without documentary evidence to support such a conclusion. Thus, the Office rejections under 103(a) are respectfully traversed.

IV. CONCLUSION

In view of the proposed claim amendments and the arguments presented above, the present application is believed to be in condition for allowance and an early notice thereof is earnestly solicited. The Office is invited to contact the undersigned counsel in order to further the prosecution of this application in any way.

Respectfully submitted,

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